PATENT SPECIFICATION 706,128

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COMPLETE SPECIFICATION.

Improvements in or relating to Plain Bearings.

We, THE GLACIER METAL COMPANY LIMITED, of 368 Ealing Road, Alperton, Wembley, Middlesex, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

This invention relates to plain bearings, and is particularly concerned with an improved method for the production of continuous strip material of the kind comprising a steel backing and a thin bearing surface layer of soft metal, such as lead, tin, or babbitt metal, from which material bearing liners, thrust washers or the like may be subsequently formed in any suitable manner.

It is recognised that for effective load-carrying capacity and service life, the facing of soft metal should be as thin as possible, subject to the consideration that the thickness should be sufficient to provide adequate embeddibility for grit in the oil and sufficient cushioning resilience to accommodate shaft flexure or the like. In fact, it is generally accepted that the thickness of the soft facing layer should be from about 0.002" to 0.004", and preferably not more than 0.002".

It is well-known to provide a steel backing with a soft facing of the character above referred to with a soft facing of the character above referred to with or without an interlayer of copper, copper-lead, lead-bronze or silver.

The method commonly employed for the purpose comprises casting the molten soft metal on to a continuously moving backing strip with the employment of edge members adapted to restrain the molten metal from flowing over the edges of the backing. Thus, in one method, the molten metal is confined to the appropriate part of the strip by runners pressing firmly on the edges of the moving strip. In another method the edges of the backing strip are turned up so as to form an endless tray for the same purpose.

The present invention has for its object to provide an improved method whereby such mechanical expedients for confining the molten metal may be avoided by employing instead certain characteristics of the materials involved to confine the molten metal to the desired area.

According to the present invention, a method for the production of continuous strip material of the kind referred to comprises electro-depositing, on a continuous backing strip of steel, an adherent coating of metal capable of being wetted by the molten soft metal which forms the bearing surface layer, said adherent coating extending up to, of short or, the edges of the backing strip, so that the said edges and marginal parts of the strip are left uncoated, applying on the coated surface an evenly distributed layer of a soft bearing metal or alloy which will not readily wet steel and heating the strip in a neutral or reducing atmosphere to a temperature sufficient to melt the soft bearing metal or alloy whereby it is bonded to the coated surface of the backing.

The soft bearing metal on melting will bond only to the coated part of the backing strip due to the fact that the molten metal will spread and flow over the coated surface but will not wet the uncoated parts of the steel backing at the edges or marginal parts of the strip.

Preferably the electro-deposited adherent coating consists of copper and the soft bearing surface layer consists of lead, lead alloy or babbitt metal containing 1% or less tin.

The adherent coating may be electro-

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Price 2/-

deposited on the steel backing in such manner that the edges or marginal parts of the strip are left uncoated. Alternatively, the adherent coating may be electro-deposited on the backing strip and the deposited coating subsequently removed from the edges or marginal parts of the strip as by cutting means.

The soft metal which forms the bearing surface layer may be applied in the form of powder or as a thin sheet or foil.

More specifically, the invention includes a method for the production of continuous strip material of the kind referred to which comprises electro-depositing on a steel backing strip an adherent coating of copper which extends up to, or short of, the edges of the backing strip, applying on the coated surface an evenly distributed layer of lead or lead alloy, and heating the strip in a neutral or reducing atmosphere to a temperature of between 400° C. and 700° C. to melt the lead or lead alloy and bond it to the copper, the temperature and period of treatment being regulated according to the thickness of the copper coating so that, while effective bonding between lead or lead alloy and copper takes place, the copper coating on the steel will not be removed completely by alloying with the lead.

The adherent coating of copper or other suitable metal may be applied by electro-deposition in such manner as to have a crystalline structure providing a rough or creviced surface for the reception of the layer of soft bearing metal.

The layer of soft bearing metal may be of graded thickness transversely of the strip so that the marginal parts of the strip are thinner than the middle part to compensate for localised thickening of blanks cut from the strip during the formation of bearing liners by a pressing operation.

In carrying the invention into effect according to a particular embodiment, a steel backing strip is electro-plated with a coating of copper to a thickness of 0.0008″, the plating either being effected in such manner that the edges are uncoated, or the coating at the edges being subsequently removed by cutting means which, if desired, also may remove the deposited copper from marginal parts of the face of the backing strip.

A soft bearing metal, such as lead, is applied in the form of powder or thin strip, or foil, so as to provide an evenly distributed layer of lead extending over the surface of the backing strip up to a short distance, for instance $\frac{1}{8}$″, from the edges. The backing strip with the layer applied thereon is then passed through a furnace in which it is heated in a neutral or reducing atmosphere to a temperature of between 400° C. and 700° C. whereby the lead is melted and bonded to the copper. The temperature and period of treatment ~~are regulated~~ according to the thickness of the copper coating so that, while effective bonding between lead and copper takes place, the copper coating on the steel will not be removed completely by alloying with the lead and thus a film of copper between the lead and the steel will be maintained. Inasmuch as lead wets copper readily, it will, when melted, flow over the copper surface, but will not flow beyond the edges thereof, due to the fact that it does not readily wet a steel surface. Thus, the lead will form an even layer which is confined to the copper-coated surface of the backing strip.

Instead of lead, an alloy such as lead with 12.5% antimony, 3% arsenic and 0.5% tin, or any other suitable babbitt type bearing alloy containing 1% or less tin, which is slow to wet steel, may be employed.

It will be understood that the invention is not limited to the particular embodiment hereinbefore described. Thus, the adherent coating on the steel backing for the reception of the facing of soft bearing metal may consist of silver or other metal or alloy which is capable of being readily wetted by the soft bearing metal in the molten state.

What we claim is :—

1. A method for the production of continuous strip material of the kind referred to, which comprises electro-depositing, on a continuous backing strip of steel, an adherent coating of metal capable of being wetted by the molten soft metal which forms the bearing surface layer, said adherent coating extending up to, or short of, the edges of the backing strip so that the said edges and marginal parts of the strip are left uncoated, applying on the coated surface an evenly distributed layer of a soft bearing metal or alloy which will not readily wet steel, and heating the strip in a neutral or reducing atmosphere to a temperature sufficient to melt the soft bearing metal or alloy whereby it is bonded to the coated surface of the backing.

2. A method according to Claim 1, wherein the electro-deposited adherent coating consists of copper.

3. A method according to Claim 1 or Claim 2, wherein the soft bearing surface layer consists of lead, lead alloy or lead babbitt metal, containing 1% or less tin.

4. A method according to any of the preceding claims, wherein the adherent coating is electro-deposited on the steel backing in such manner that the edges or marginal parts of the strip are left uncoated.

5. A method according to any of the preceding Claims 1 to 3, wherein the adherent coating is electro-deposited on the backing strip and the deposited coating subsequently removed from the edges or marginal parts of the strip as by cutting means.

6. A method according to any of the preceding claims, wherein the soft metal which forms the bearing surface layer is applied in the form of powder.

7. A method according to any of the preceding Claims 1 to 5, wherein the soft metal which forms the bearing surface layer is applied as a thin sheet or foil.

8. A method for the production of continuous strip material of the kind referred to, which comprises electro-depositing on a steel backing strip an adherent coating of copper which extends up to, or short of, the edges of the backing strip, applying on the coated surface an evenly distributed layer of lead or lead alloy, and heating the strip in a neutral or reducing atmosphere to a temperature of between 400° C. and 700° C. to melt the lead or lead alloy and bond it to the copper, the temperature and period of treatment being regulated according to the thickness of the copper coating so that, while effective bonding between lead or lead alloy and copper takes place, the copper coating on the steel will not be removed completely by alloying with the lead.

9. A method according to any of the preceding claims, wherein the adherent coating of copper or other suitable metal is applied by electro-deposition ~~in such manner~~ as to have a crystalline structure providing a rough or creviced surface for the reception of the layer of soft bearing metal.

10. A method according to any of the preceding claims, wherein the layer of soft bearing metal is of graded thickness transversely of the strip so that the marginal parts of the strip are thinner than the middle part to compensate for localised thickening of blanks cut from the strip during the formation of bearing liners by a pressing operation.

11. The method for the production of continuous strip material of the kind referred to, substantially as hereinbefore described.

12. Composite strip material produced by the method herein claimed.

13. Plain bearings produced from the composite material claimed in Claim 12.

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PROVISIONAL SPECIFICATION.

Improvements in or relating to Plain Bearings.

We, THE GLACIER METAL COMPANY LIMITED, of 368 Ealing Road, Alperton, Wembley, Middlesex, a British Company, do hereby declare this invention to be described in the following statement :—

This invention relates to bearing liners of the kind comprising a steel backing and a thin bearing surface layer of soft metal, such as lead, tin or a babbitt metal.

It is recognised that for effective load carrying capacity and service life, the facing of soft metal should be as thin as possible, subject to the consideration that the thickness should be sufficient to provide adequate embeddibility for grit in the oil and sufficient cushioning resilience to accommodate shaft flexure or the like. In fact, it is generally accepted that the thickness of the soft facing layer should be from about 0.002 to 0.004 inches, and preferably not more than 0.002.

It is well-known to provide a steel backing with a soft facing of the character above referred to with or without an interlayer of copper, copper lead, lead bronze or silver.

The present invention is particularly concerned with an improved method for the production of continuous strip material from which bearing liners, thrust washers or the like may be subsequently formed in any suitable manner. The method commonly employed for the purpose comprises casting the molten soft metal on to a continuously moving backing strip with the employment of edge members adapted to restrain the molten metal from flowing over the edges of the backing. Thus, in one method, the molten metal is confined to the appropriate part of the strip by runners pressing firmly on the edges of the moving strip. In another method the edges of the backing strip are turned up so as to form an endless tray for the same purpose.

The present invention has for its object to provide an improved method whereby such mechanical expedients for confining the molten metal may be avoided by employing instead certain characteristics of the materials involved to confine the molten metal to the desired area.

According to the present invention, a continuous backing strip of steel is provided by electro-deposition with an adherent coating of copper or other suitable metal or alloy capable of being wetted by the molten soft metal which forms the bearing surface layer, said adherent coating extending to or short of the edges of the backing strip so that the edges, and if desired the marginal parts of the

strip, are left uncoated, applying on the coated surface an evenly distributed layer of a soft bearing metal or alloy which will not readily wet steel, and heating the strip in a neutral or reducing atmosphere to a temperature sufficient to melt the soft bearing metal or alloy whereby it is bonded to the coated surface of the backing.

The invention is especially applicable to the production of material for the manufacture of bearing liners, having a thin bearing surface layer of lead, lead alloy or a babbitt metal, bonded to the backing by a thin interlayer of copper.

In a preferred embodiment, copper or other suitable metal or alloy is electro-deposited on the steel backing strip in such manner that the edges and/or marginal parts of the strip are left uncoated, or the thin layer of copper or the like may be electro-deposited on the backing strip and the deposited coating subsequently removed from the edges and/or marginal parts of the strip as by cutting means.

The lead, lead alloy or babbitt for forming the thin coating of soft bearing metal may be applied in the form of powder or as a thin sheet or foil so as to provide an evenly distributed layer which, on being subjected to a suitable temperature in a neutral or reducing atmosphere, will melt and bond only to the coated part of the backing strip, due to the fact that the molten metal will spread and flow over the coating of copper or the like but will not wet the uncoated parts of the steel backing at the edges or margins of the strip.

In carrying the invention into effect according to a particular embodiment, a steel backing strip is electroplated with a coating of copper to a thickness of 0.0008 inches, the plating either being effected in such manner that the edges are uncoated, or the coating at the edges being subsequently removed by cutting means which, if desired, also may remove the deposited copper from marginal parts of the face of the backing strip.

A soft bearing metal, such as lead, is applied in the form of powder or thin strip, or foil, so as to provide an evenly distributed layer of lead extending over the surface of the backing strip up to a short distance, for instance $\frac{1}{8}$", from the edges. The backing strip with the layer applied thereon is then passed through a furnace in which it is heated in a neutral or reducing atmosphere to a temperature of between 400 and 700° C. whereby the lead is melted and bonded to the copper. The temperature and period of treatment are regulated to suit the thickness of the copper layer so that, while effective bonding between lead and copper takes place, the copper coating on the steel will not be removed and thus a film of copper between the lead and the steel will be maintained. Inasmuch as lead wets copper readily, it will, when melted, flow over the copper surface, but will not flow beyond the edges thereof, due to the fact that it does not readily wet a steel surface. Thus, the lead will form an even layer which is confined to the copper-coated surface of the backing strip.

Instead of lead, an alloy such as lead with 12.5% antimony, 3% arsenic and 0.5 % tin, or any other suitable babbitt type bearing alloy, which is slow to wet steel, may be employed.

The adherent coating of copper or other suitable metal or alloy may be applied by electro-deposition in such manner as to have a crystalline structure providing a rough or creviced surface for the reception of the coating of soft bearing metal. Moreover, the said coating may be of graded thickness transversely of the strip so that the marginal parts of the strip are thinner than the middle part to compensate for localised thickening of blanks cut from the strip during formation into bearing liners by a pressing operation.

It will be understood that the invention is not limited to the particular embodiment hereinbefore described. Thus, the adherent coating or layer on the steel backing for the reception of the facing of soft bearing metal may consist of silver or other metal which is capable of being readily wetted by the soft bearing metal in the molten state.

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